CHARLOTTE.

SHARED SERVICES

LTE Data Transport for Public Service

Steve Koman

September 27, 2011

CITY OF CHARLOTTE

LTE Data Transport Primer

- Topics
  - Fundamental Information
  - Basic Elements
  - Comparison to Wireless Carrier LTE Services
  - State & Local Planning
  - Q&A and Contacts

Fundamentals

- What is LTE Data Transport for Public Service?
  - Long Term Evolution (LTE) is a **4G wireless broadband technology** developed by the Third Generation Partnership Project (3GPP), a worldwide industry trade group
    - LTE is TCP/IP v4 and v6 data communication at Layers 3+ for public service use
    - High Speed, High Throughput, Low Latency Wireless Network
    - True all IP network, security mechanisms, IPv6 suites, GRE, G-UDP streaming, etc
    - LTE is capable of supporting mixed data, voice, video and messaging traffic
    - Voice over LTE (VoLTE) currently being developed; at least 4 to 5 years out
    - Push-To-Talk (PTT) is being developed by vendors; not quite standardized just yet
    - **NOT** (yet) a replacement for Public Safety Land Mobile Radio Systems
    - LTE Rev 10 is true 4G (4G means 100 MB/s); Charlotte system is Rev 9
    - **Private 750 MHz Licensed Spectrum Reserved for Public Safety Broadband**
      - 20x20: 758-769 MHz (typical DownLink) 788-799 MHz (typical Uplink)
      - Downlink well in excess of 10 Mbps (Uplink > 5 Mbps) [At 70% RAN Load]
      - Radio wave propagation is similar to 800 MHz
      - Different technology than P25 LMR, therefore different radio link budgets
    - **Spectrum Act expanded the potential user base (DHS definition)**
    - LTE has been successfully deployed by ATT, Verizon and others for years

Fundamentals

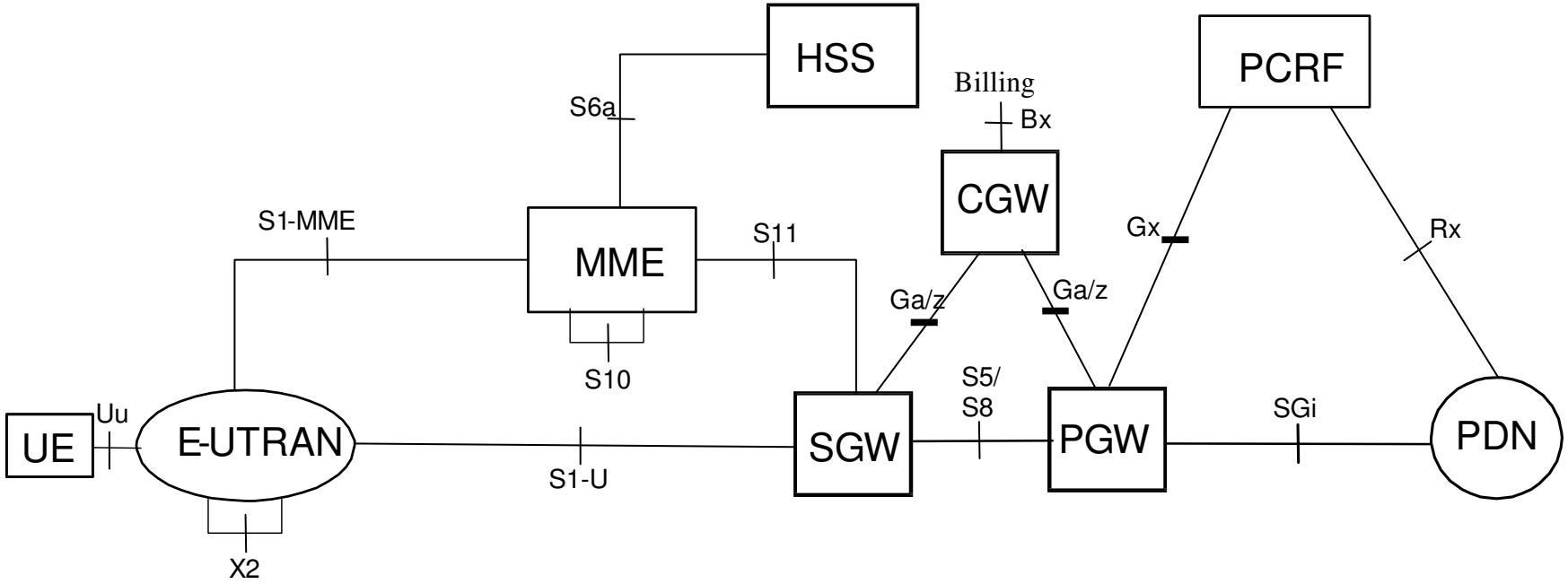
- What is LTE Data Transport for Public Service?
  - LTE is Highly Standardized by 3GPP [TS 22.xxx TS 36.xxx examples]
  - FCC Orders mandate use of LTE for public safety broadband
    - FCC Orders specify use of 3GPP LTE, required interfaces and other aspects
- INTEROPERABILITY
  - Key Reference Document: FCC TAB Final Report
    - "Recommended Minimum Technical Requirements to Ensure Nationwide Interoperability for the Nationwide Public Safety Broadband Network" - Final Report, May 22, 2012 by FCC Technical Advisory Board for First Responder Interoperability

Fundamentals

- Influencers
  - Third Generation Partnership Project (3GPP)
  - Federal Communications Commission
    - FCC role in communications and spectrum matters mostly undiminished
    - FCC Technical Advisory Board (TAB) conveyed Minimum Technical Requirements for FirstNet; refer especially to section 3.3.2 re: Public Safety Reqs & LTE Standards
  - Public Safety Communications Research (PSCR within NIST NTIA)
    - Technical representation and research; typically RAN and Core infrastructure
    - Examples: VoLTE, vocoders, interoperability
  - First Responder Network Authority (FirstNet - FNN)
    - Licensee for National Public Safety Broadband Network (**NPSBN**)
    - Future center-point for nearly all things public safety LTE broadband
  - NPSTC, APCO, PSST-OAC, NGA & States
  - Vendors
    - Alcatel-Lucent, Cassidian, Harris, IP Wireless/GD, Motorola Solutions/Ericsson, Nokia Siemens, Verizon, ATT, Raytheon among others

System Elements

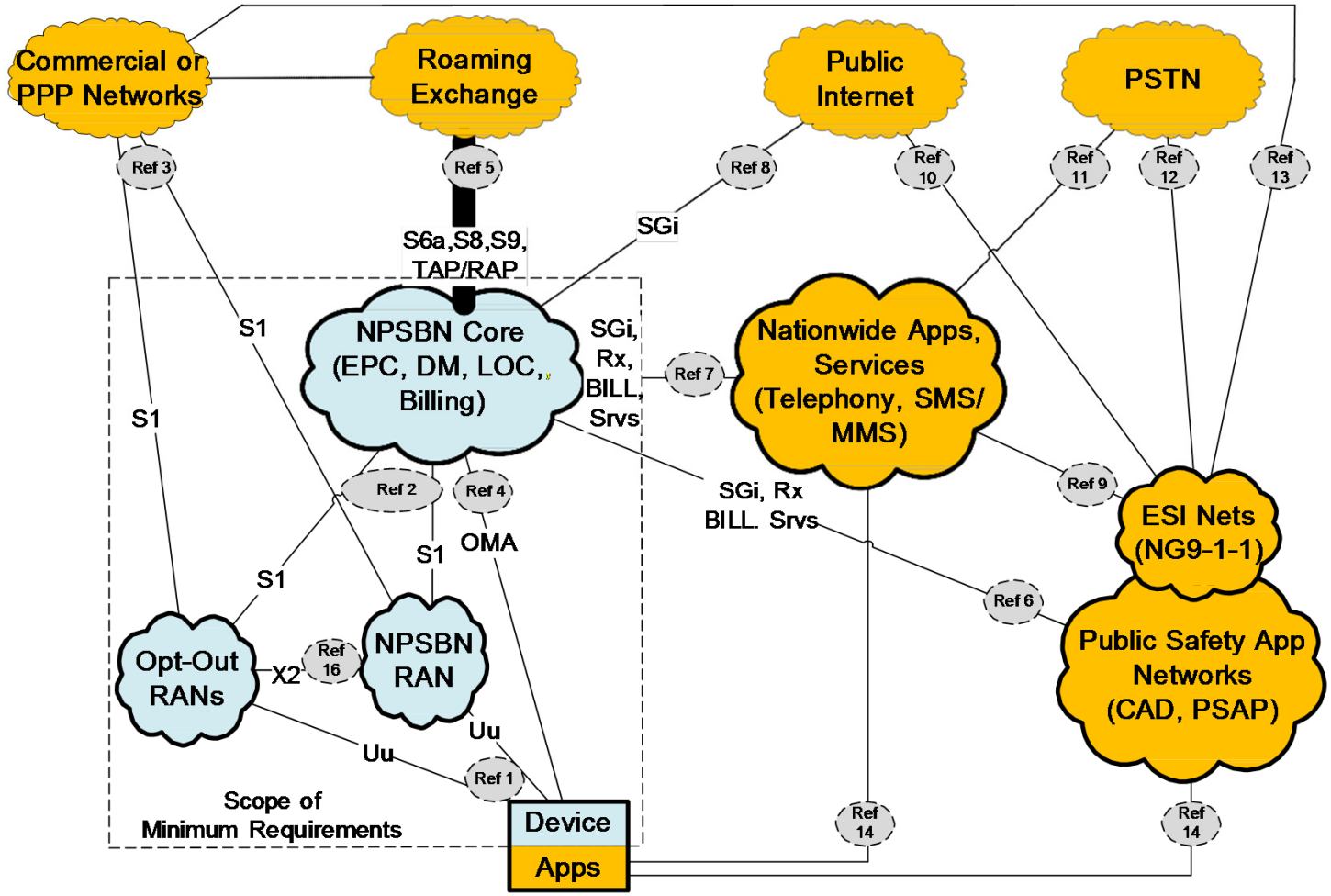
SOURCE: "Recommended Minimum Technical Requirements to Ensure Nationwide Interoperability for the Nationwide Public Safety Broadband Network"
FCC Technical Advisory Board for First Responder Interoperability - Final Report, May 22, 2012



FCC TAB Figure 3: 3GPP LTE Reference Architecture

System Elements

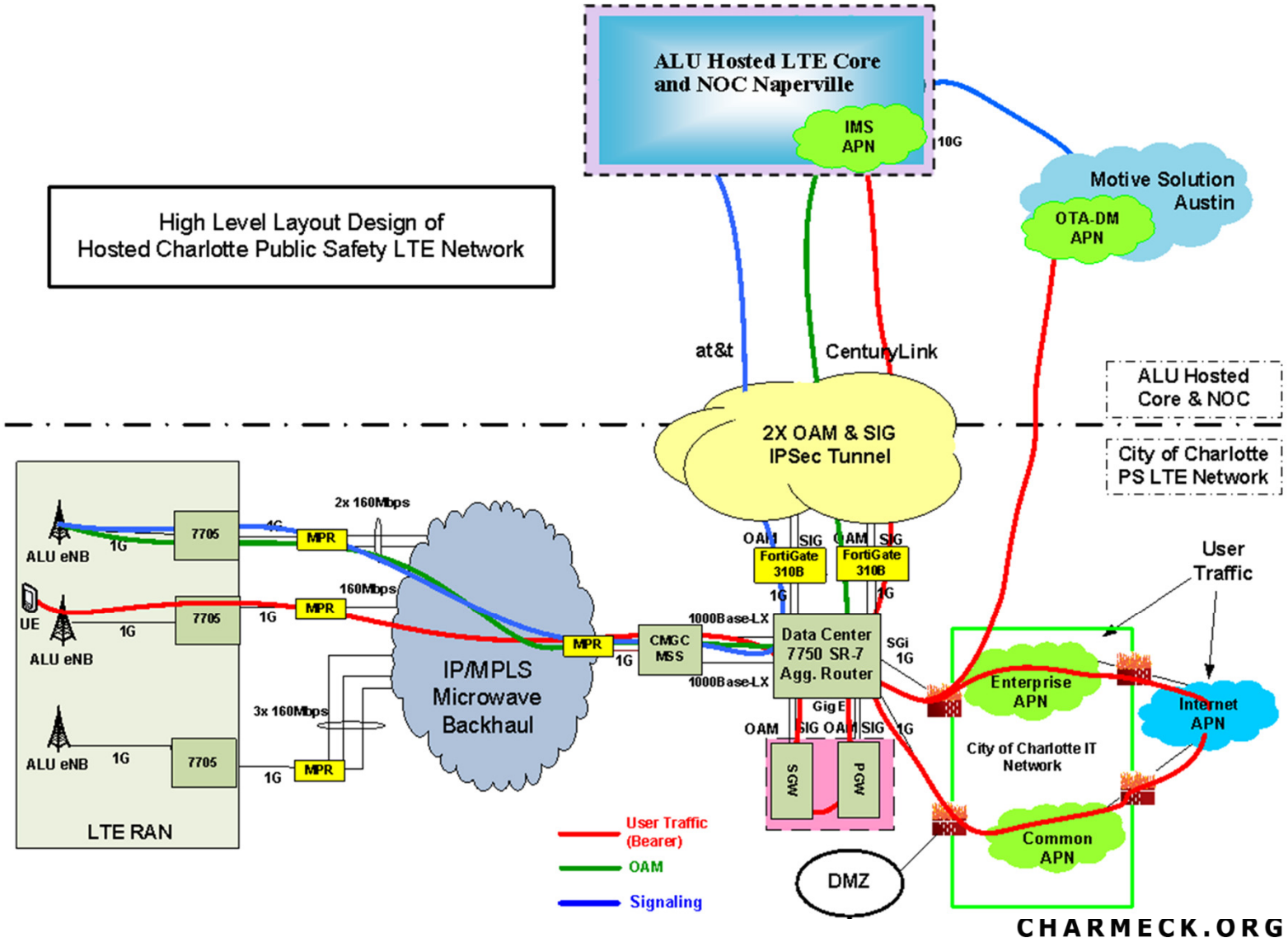
SOURCE: "Recommended Minimum Technical Requirements to Ensure Nationwide Interoperability for the Nationwide Public Safety Broadband Network"
FCC Technical Advisory Board for First Responder Interoperability - Final Report, May 22, 2012



FCC TAB - NPSBN Landscape Model

CITY OF CHARLOTTE

System Elements – Charlotte HLD



CITY OF CHARLOTTE

Comparison to Carrier Services

- Similarities to Carrier Services
  - Same data communication as commercial LTE wireless providers
    - ATT, Verizon, others
    - End-To-End secure IP transport is possible utilizing the appropriate IP suite elements
    - Commercial services typically Turn-key; buy a service
  - Jurisdiction or Law Enforcement Agency's internal IT network infrastructure is relatively similar for using NPSBN or commercial carrier transport **{except}**
    - APNs, firewalling, IPv6 address space, adequate cloud connectivity, network path to RAN
  - Many uE (user equipment) device aspects similar between services
    - Situation is in constant change; dominated by device development cycles, chips, economics and pricing power
    - Current public safety devices are loosely based on industry standards, but have many proprietary tendencies -- Band 14
    - Current commercial carrier destined devices mostly standards based – Band 13, 17 but may not meet public safety needs
    - Public Safety UICC (SIM) & uEs need to support multiple APNs and PLMN IDs
  - Roaming between NPSBN/FirstNet and Commercial Carriers ?
    - Roaming between RAN networks **WILL** occur and capability is mandated
    - Different PLMN Ids (current public safety PLMN ID per FCC is 313100)
    - Commercial standards for roaming barely exist and are not implemented

Comparison to Carrier Services

- Differences & Advantages of Public Safety LTE
  - Private System & Spectrum for Public Service
    - Resources generally will not be shared with general public commercial users
    - More predictable, dependable network performance
    - Currently: Commercial LTE network operations are not optimized for Public Safety (particularly network and system management, OAM)
    - Currently: Commercial network use does not provide Public Safety with sufficient visibility into network management and trade-off factors
    - 'Local management within a national framework' would allow tailoring of radio and system resources to more effectively allow law enforcement and responder command centers to adjust to specific incidents and evolving circumstances in near real-time
  - Ability to Prioritize Traffic (QoS/QCI)
    - "Inability to prioritize traffic on commercial network for the mobile environment has resulted in situations where urgent communication data was unacceptably delayed."
    - Public Safety LTE likely will allow modification of traffic priorities and User Equipment (UEs) access during critical incidents
  - FirstNet
    - EPC Hosted Core (analogous to Charlotte's Cloud Core Services)
    - Service Delivery Platform (SDP) & Other system services
    - Procurement Services (???)

State & Local PLANNING

- STATE & LOCAL PLANNING
  - NTIA Five Year Two Phase planning process
    - Start approx mid-2013
    - Phase 1 ~ 2 years duration
      Preliminary grants: Need based not competitive, NOT DETAIL DESIGN
    - Phase 2 ~ 2 yrs duration –
      These are Detailed Designs
    - Buildout begins AFTER spectrum auction

- Getting In Line
  - State of NC responded to NTIA RFI
  - Apply for preliminary planning grant
  - Governance
    - State Office of CIO
    - SWIC
    - Broad representation

CITY OF CHARLOTTE

LTE Contacts: City of Charlotte

- Policy Executive: Chuck Robinson, Director Shared Services [CLRobinson@CharlotteNC.gov]
- Project Manager: Nelson Baker [Nelson.Baker@MecklenburgCountyNC.gov]
- Solution Architect: Wim Brouwer [Wim.Brouwer@alcatel-lucent.com]
- Program Manager: Steve Koman [SKoman@CharlotteNC.gov] [K4SCK@arrl.net Steve@Koman.US]